Remarks

Status of the Application

The Office rejected various of the claims for missing antecedents and lack of support in the specification.

The Office rejected Claims 1-33 over *Rosenberg*, alone or in various combinations.

Applicant has canceled Claims 1, 2, and 33.

Applicant has rewritten Claim 3 in independent form, including all and only the limitations of the parent and any intervening claims; the scope of the rewritten claim is unchanged.

Applicant has rewritten Claim 14 in independent form, including all the limitations of the parent and any intervening claims, and adding clarification of certain claim limitations.

Applicant has amended Claims 5, 6, 13, and 32 to more clearly define certain limitations in the original presentation.

Applicant has added new Claim 34, dependent on Claim 15; and independent Claim 35; and Claims 36-38 dependent on Claim 35.

Applicant appreciates the Office's careful and thorough analysis of the art and explanation of the grounds for rejections. As discussed below, Applicant has amended certain of the Claims to cure certain of the objections and rejections, and respectfully traverses others of the rejections.

Art Cited

U.S. Patent 6,219,032B1 (*Rosenberg*) concerns various methods of using force feedback to assist a user in operating a two dimensional graphic user interface (*GUI*) such as a windowing operating system. *Rosenberg* concerns the motion of cursor in a conventional windowed user interface, where the user may move the cursor within and across window boundaries, and may use the cursor to control various window operations such as scrolling. Relevant to the present invention, *Rosenberg* teaches that a haptic device can be used to present a simulated groove to help a user keep a cursor within a portion of the interface designated as a scroll bar. *Rosenberg* also teaches the use of a haptic device to present simulated bumps to a user when the user moves a cursor across window boundaries, helping the user to feel when window boundaries are crossed. *Rosenberg* does not teach any specifics relating to three dimensional interfaces, and does not teach user-controlled motion of any object other than a cursor.

U.S. Patent 5,655,093 (*Frid-Nielson*) concerns a two dimensional user interface having a changeable cursor icon. *Frid-Nielson* teaches that the system is useful for helping a user to enter valid information. *Frid-Nielson* teaches that the visual representation of a cursor can be changed to indicate actions that the user can take at the current cursor position. For example, the visual representation of a cursor can comprise a mouse, with symbols drawn on the mouse representing valid click combinations at the present cursor position on the screen. *Frid-Nielson* does not mention force feedback, and does not mention any interaction by the user with objects other than a visual representation of a cursor.

U.S. Patent 6,191,785 (*Bertram*) concerns dynamic manipulation of data values using slide bars in a computer interface. One or more slide bars are mapped to motion of a pointing device, and the user moves

the pointing device to change the position of an element along the slide bar. The position of the element on the slide bar is used to manipulate values associated with graphical elements in a data-processing system. *Bertram* does not mention force feedback, and does not teach control of the motion of any object other than a slider along a slide bar.

U.S. Patent 6,583,782 (*Gould*) concerns a "virtual force feedback interface," in which various cursor and input device manipulations are proposed as alternatives to force feedback. *Gould* teaches that devices with actual force feedback are undesirable due to excessive cost and to mechanical noise. *Gould* column 2 lines 1-25. *Gould* generally teaches the modification of the on-screen motion of a cursor, and allows an on-screen cursor to follow a more precise path than that required of an input device controlled by a user. *Gould* teaches that its invention is an alternative to force feedback, and consequently has no teaching of force feedback in connection with its invention. *Gould* column 6 lines 51-62. *Gould* also concerns only the control of an on-screen cursor, not the control of objects in a simulation.

U.S. Patent 6,277,030 (*Baynton*) concerns a training apparatus, where a desired golf swing is programmed into a computer-assisted training device. A student swings a special golf club, and the computer prevents motion other than along the desired swing path. *Baynton's* application is exclusively for teaching of desired physical motion; there are no other objects in *Baynton's* application. Consequently, *Baynton* has no teaching of interaction of the golf club with other objects in an application, and no teaching of application of forces except those required to conform the user's club swing to the exact path defined as ideal.

The present invention

The present invention concerns the use of a haptic interface device to allow a user to control an object in a computer application. The computer application can present a highly accurate visual representation of the motion of the object, analogous to motion of a similar object in the physical world. The complexity of such an accurate representation can be incompatible with the limitations of available interface devices (e.g., it is not effective to try to simulate every body movement involved in swinging a golf club). The present invention provides for a path that is suitable for the haptic interface device, and establishment of a correspondence between the path for the interface device and the path that will be presented visually. This correspondence allows a user to control and experience an object with appropriate input device motions and forces, without sacrificing highly realistic visual representations.

Claim objections, and rejections under 35 U.S.C. 112

Applicant has amended the Claims to cure the missing antecedents noted by the Office, and submits that the corresponding objections have been cured.

Applicant has amended the Specification to add wording from the originally filed Claims, and submits that the corresponding rejection has been cured.

Newly independent Claim 3, and Claims 4-13, 15-24, 26-32, and 34 dependent on Claim 3

The Office rejected these claims under 35 U.S.C. 102 as anticipated by *Rosenberg*. The Office cited *Rosenberg's* teaching of a groove for guiding movement of a cursor (citing *Rosenberg* column 38 line 38 –

column 9 line 39), and *Rosenberg's* teaching of provision of force feedback when a cursor crosses window boundaries (citing *Rosenberg* column 44 line 65 – column 45 line 21). Applicant respectively traverses this rejection.

Rosenberg teaches various ways to use force feedback to assist a user interacting with a GUI. *Rosenberg* teaches the use of a groove formed by specific force profiles to allow a user to keep a cursor **within** a scroll bar. *Rosenberg* column 38 line 38 – column 9 line 39. *Rosenberg* also teaches providing bumps or other force impulses to communicate to the user when a cursor **crosses window boundaries** within the GUI. *Rosenberg* column 44 line 65 – column 45 line 21. *Rosenberg's* grooves **keep** a cursor within a region of the GUI. *Rosenberg's* bumps, on the other hand, communicate when the cursor **crosses** boundaries. According to *Rosenberg's* teaching, a user can be **moving within** a region of the GUI corresponding to a groove (e.g., within a scroll bar portion of the GUI), or can be **moving across** regions of the GUI (e.g., moving a cursor across multiple regions of the display). *Rosenberg* has no teaching, however, of communicating forces to the user based on interactions with the application while in a groove. This is as would be expected since *Rosenberg* teaches grooves and bumps as applicable in different scenarios: grooves while **in** a region, and bumps while **traversing** regions.

In contrast, Applicant's claim 3 recites the limitation that forces responsive to interaction with the application be communicated to the user **while** the user is moving an input device along a device fundamental path. This combination would have no meaning in *Rosenberg's* teaching, since *Rosenberg's* grooves are applicable **within** a region, and *Rosenberg's* bumps are applicable when **crossing** regions. In Applicant's teaching, and as expressed in Claim 3, the combination is useful in such examples as computer games, where the user must move an object along a specific path but the object can also interact with the game while it is moving along the path.

Further, *Rosenberg's* teaching applies to motion of a **cursor** within a GUI. In contrast, Applicant's claim 3 is limited to the control of an **object** in an application. A cursor, as used in *Rosenberg* and as generally known to those skilled in the art, is a representation on a display of a point at which the user can initiate some action. User manipulation of an input device can move a cursor on the screen, and the user can initiate some action (e.g., insert text, or select a file) based in part on the relationship of the cursor to the rest of the display. In contrast, Applicant's claim is limited to control of an object in the application. As shown in Applicant's examples, an object is not just the location of a point of interest on the screen; rather, an object corresponds to an entity on the screen and represented in the application (e.g., a golf club or a pool cue). *Rosenberg* teaches control of cursors, not objects, in an application.

Since *Rosenberg* does not teach all the limitations of Claim 3, specifically the limitation that forces responsive to interaction with the application be communicated while the device is moved along the device fundamental path, *Rosenberg* does not anticipate Claim 3. *See* MPEP 2131; Verd*ergaal Bros. v. Union Oil Company of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); *Richardson v. Suzuki Motor Company*, 9 USPQ2D 1913, 1920 (Fed. Cir. 1989). Accordingly, Applicant submits that Claim 3 is in condition for allowance. Applicant further submits that Claims 4-13, 15-24, 26-32, and 34, depending from Claim 3, are

also in condition for allowance. *See* MPEP 2143.03; *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). As discussed, certain of the dependent claims have additional limitations not taught or suggested in the art.

Claim 4, dependent on Claim 3

The Office rejected Claim 4 as anticipated by *Rosenberg*. Claim 4 depends from Claim 3, and recites the additional limitation that forces applied to the haptic input device correspond to momentum and inertia of an object in the application. The Office did not indicate any specific cite to *Rosenberg* for this limitation. Applicant submits that *Rosenberg* has no such teaching, as would be expected since *Rosenberg* teaches control of a **cursor**. Cursors, as understood by those skilled in the art, represent points of interest or action on a display, but do not themselves have momentum or inertia. Accordingly, *Rosenberg* does not teach forces corresponding to momentum or inertia, since in *Rosenberg* there is no object that has such properties. Since *Rosenberg* does not teach all the limitations of Claim 4, there is no *prima facie* case of anticipation. *See* MPEP 2131; Verd*ergaal Bros. v. Union Oil Company of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); *Richardson v. Suzuki Motor Company*, 9 USPQ2D 1913, 1920 (Fed. Cir. 1989). Applicant submits that Claim 4 is in condition for allowance.

Claims 5 and 6, dependent on Claim 3

The Office rejected Claims 5 and 6 as anticipated by *Rosenberg*. Claims 5 and 6 depend from Claim 3, and recite the additional limitation of the object path (Claim 5) or the device path (Claim 6) being dependent on the state of the application. The Office suggested that *Rosenberg* taught this limitation in *Rosenberg's* teaching of a button to turn off the forces in a groove. *Rosenberg* column 57 line 61 – column 58 line 8. Applicant has amended Claims 5 and 6 to clarify that the shape of the corresponding path is dependent on the state of the application. *Rosenberg's* teaching allows a user to turn forces off with a switch, but does not teach changing the shape of one of the paths according to the state of the application. Accordingly, *Rosenberg* does not teach all the limitations of either Claim 5 or Claim 6, and there is no *prima facie* case of anticipation. *See* MPEP 2131; Verd*ergaal Bros. v. Union Oil Company of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); *Richardson v. Suzuki Motor Company*, 9 USPQ2D 1913, 1920 (Fed. Cir. 1989). Applicant submits that Claims 5 and 6 are in condition for allowance.

Claim 9, dependent on Claim 3

The Office rejected Claim 9 as obvious in view of *Rosenberg* and *Frid-Nielson*. As discussed above, Applicant submits that *Rosenberg* does not teach all the limitations of parent Claim 3. *Frid-Nielson* does not supply the teaching missing from *Rosenberg*. Neither *Rosenberg* nor *Frid-Nielson* teach forces while in a defined path: *Rosenberg* only teaches such forces when moving across windows, and *Frid-Nielson* does not teach any force feedback at all. Neither *Rosenberg* nor *Frid-Nielson* teach control of objects: *Rosenberg* teaches control of a cursor, and *Frid-Nielson* teaches changing the displayed appearance of a cursor. Further, Applicant submits that there is no suggestion to combine *Rosenberg* and *Frid-Nielson*.

For a *prima facie* case of obviousness, there must be a teaching or suggestion either explicitly or implicitly in the references themselves to combine the references. *See* MPEP 2143.01. The fact that references **can**

be combined is not sufficient. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). The fact that the claimed invention would be within the skill of one of ordinary skill in not enough. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). *See also In re Kotzab*, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000). The Office asserted that *Frid-Nielson* suggested the Office's combination at column 8 lines 29-48.

Applicant respectfully traverses the propriety of the proposed combination. The cited section of *Frid-Nielson* merely recognizes that intuitive user interfaces are desirable. *Frid-Nielson* does not mention **force feedback**, or suggest that the adaptive cursor it teaches would be useful in combination with force feedback. *Rosenberg* does not have any suggestion of **changing cursor appearance** taught by *Frid-Nielson*. While *Frid-Nielson* recognizes that intuitive interfaces are desirable, it does not suggest any combination that would produce the invention of Claim 9. Applicant submits that the proposed combination is improper, and, even if proper, does not teach or suggest all the limitations of Claim 9. Accordingly, there is no *prima facie* case of obviousness of Claim 9. *See* MPEP 2143.01; MPEP 2145.X.C. Applicant submits that Claim 9 is in condition for allowance.

Claim 15, dependent on Claim 3, and Claims 16-18 and 34 dependent on Claim 15

The Office rejected Claim 15 as obvious in view of *Rosenberg* and *Gould*. The Office relied on *Rosenberg* for teaching of force feedback by applying forces to an input device, and on *Gould* for teaching of device paths that were different from object paths. As discussed above, Applicant submits that *Rosenberg* does not teach all the limitations of parent Claim 3. *Gould* does not supply the teaching missing from *Rosenberg*. Neither *Rosenberg* nor *Gould* teach forces while in a defined path: *Rosenberg* only teaches such forces when moving across windows, and *Gould* does not teach any force feedback at all. Further, Applicant submits that there is no suggestion to combine *Rosenberg* and *Gould*.

For a *prima facie* case of obviousness, there must be a teaching or suggestion to combine the art. *See* MPEP 2143.01 ("Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art."). The fact that references **can** be combined is not sufficient. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). The fact that the claimed invention would be within the skill of one of ordinary skill in not enough. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). *See also In re Kotzab*, 217 F.3d 1365, 1371, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000). The Office asserted that *Gould* suggested the Office's combination in its mention of "background mechanical noise." *Gould* column 6 line 63 – column 7 line 3.

Gould teaches that differing device and cursor paths are desirable as an **alternative** to actual forces. *Gould* column 6 lines 50-62. Accordingly, *Gould* teaches that its invention is useful instead of actual force as taught by *Rosenberg*, and thus teaches away from the situation implicated by the Office's combination. *Rosenberg* does not teach inclusion of an alternative such as *Gould*, indeed, *Rosenberg* states that targets have the "**exact dimensions**" of the associated graphical objects. *Rosenberg* column 45 lines 32-44. The

only teaching of a combination of differing paths and actual forces is in Applicant's application. Thus there is no suggestion of forming the proposed combination. *See* MPEP 2142.02; MPEP 2143.01; MPEP 2145.X.D2; *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983). Moreover, *Gould* teaches away from the proposed combination by teaching **virtual** force feedback as an alternative to **actual** force feedback. *See* MPEP 2143.01; MPEP 2145.X.C. Accordingly, since there is not a proper basis for the proposed combination, there is no *prima facie* case of obviousness of Claim 15. Further, the proposed combination, even if proper, does not teach or suggest all the limitations of Claim 15. Applicant submits that Claim 15, and Claim 20 depending therefrom, are in condition for allowance. MPEP 2143.03; *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

New Claim 34, dependent on Claim 15

As discussed above, Applicant submits that *Rosenberg* does not teach all the limitations of parent Claim 3, and that the combination of *Rosenberg* and *Gould* does not establish a *prima facie* case of obviousness of parent Claim 15. Further, new Claim 34 recites the limitation that the device and object fundamental paths not be in one to one correspondence. All of *Rosenberg's* paths require a one to one correspondence; indeed, *Rosenberg's* grooves are designed to keep the user moving the input device such that a one to one correspondence can be maintained while the cursor moves in the GUI. Accordingly, Applicant submits that new Claim 34 is in condition for allowance.

Claim 19, dependent on Claim 3, and Claim 20, dependent on Claim 19

The Office rejected Claim 19 as anticipated by *Rosenberg*. As discussed above, Applicant submits that *Rosenberg* does not teach all the limitations of parent Claim 3. Claim 19 recites the additional limitation that characteristics of the object respond to motion of the input device off the device fundamental path. The Office suggested that *Rosenberg* taught such a limitation in *Rosenberg's* teaching of a command gesture. *Rosenberg* column 45 line 61 – column 46 line 19. Applicant respectfully traverses this rejection, since initiation of a command gesture as taught by *Rosenberg* is not the same as changing a characteristic of an object.

In the Office's application of *Rosenberg's* teaching to Applicant's claims, an **on-screen cursor** must be considered as the **object** moved in correspondence with motion of the input device. *Rosenberg* has no teaching of any command gesture that would change a characteristic of the **cursor**, however, not surprising since in *Rosenberg's* two dimensional GUI the cursor is used to move among windows, and command gestures are used to control the application. There is no need in *Rosenberg's* system to change a characteristic of the cursor. In contrast, Applicant teaches motion of an input device to control an object in an application, which object can have its own changeable characteristics in the application. The only teaching of changing object characteristics in response to motion of the input device off the device path is in Applicant's application. Accordingly, there is no *prima facie* case of anticipation. *See* MPEP 2131; Verdergaal Bros. *v. Union Oil Company of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); *Richardson v. Suzuki Motor Company*, 9 USPQ2D 1913, 1920 (Fed. Cir. 1989). Applicant submits that Claim 19, and Claim 20 depending from Claim 19, are in condition for allowance.

Claim 29, dependent on Claim 3

The Office rejected Claim 29 as anticipated by *Rosenberg*. Claim 29 depends from Claim 3 through Claim 26, and recites the additional limitation of a motion-initiation signal derived from a combination of cursor position and a user-actuated switch. The Office suggested that *Rosenberg* taught this limitation in *Rosenberg's* teaching of a button while the cursor is positioned in a particular region of *Rosenberg's* GUI. *Rosenberg* teaches the use of applied forces to assist a user in moving a cursor to a target, then allowing control of a button to modify forces. *Rosenberg* column 45 line 61 – column 46 line 12. In *Rosenberg's* teaching, therefore, the device fundamental path is used to help move the cursor to a target, and then a button is allowed to control forces. The device path is initiated independently of the button state; the button state is then used to modify forces applied.

In contrast, Applicant's claim 29 recites the limitation that the device fundamental path is established only after motion of the cursor **and** after initiation of a switch. Unlike *Rosenberg*, the device path is not used to help the user find a target where a switch can be subsequently activated; rather, the device path is only started **after** the user moves to an appropriate region **and activates the switch**. Since *Rosenberg* teaches only a button **after** motion along a device path, instead of initiation of a device path based on motion and a switch, *Rosenberg* does not teach all the limitations of Claim 29. Accordingly, there is no *prima facie* case of anticipation. *See* MPEP 2131; Verd*ergaal Bros. v. Union Oil Company of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); *Richardson v. Suzuki Motor Company*, 9 USPQ2D 1913, 1920 (Fed. Cir. 1989). Applicant submits that Claim 29 is in condition for allowance.

Claim 31, dependent on Claim 3

The Office rejected Claim 31 based on a combination of *Rosenberg* and *Baynton*. Applicant has amended Claim 31 to depend from Claim 3, and to clarify that "interaction with the application" in Claim 31 comprises interaction with other objects in the application. As discussed above, *Rosenberg* does not teach all the elements of parent Claim 3. *Baynton* does not supply the missing teaching. Specifically, as applied to Claim 31, neither *Rosenberg* nor *Baynton* have any teaching of forces from interaction with objects in the application. *Baynton* has no objects other than the controlled golf club; *Rosenberg* only has windows and a graphical cursor that the user can move across window boundaries. Accordingly, the art does not teach or suggest all the limitations of Claim 31 (e.g., forces based on interactions with other objects in the application), and there is no *prima facie* case of obviousness of Claim 31. Applicant submits that Claim 31 is in condition for allowance.

New Claim 38, dependent on Claim 31

New Claim 38 depends from Claim 31, and adds the limitation that the object and device fundamental paths have different shapes. *Baynton* teaches an invention for training the execution of a desired golf swing; having differently shaped paths would destroy *Baynton's* utility as a training device (since the device would be training an incorrect swing path). In contrast, Applicant's invention can allow differently shaped paths to enable simplified control to be used together with complex and realistic visual display. Since there is no proper combination of the art that teaches or suggests all the limitations of new Claim 38, there is no

prima facie case of obviousness of Claim 38. Applicant submits that new Claim 38 is in condition for allowance.

Newly independent Claim 14, and Claim 25 dependent on Claim 14

The Office rejected Claim 14 as anticipated by *Rosenberg*. Applicant has rewritten Claim 14 in independent form, including all the limitations in the original parent Claim 1. Applicant has further amended Claim 14 to clarify the meaning of the starting region. Claim 14 recites the limitation that a force be applied to urge the input device to a starting region of the range of motion of the haptic input device. The Office suggested that *Rosenberg* taught this limitation in *Rosenberg's* teaching of forces applied to urge a cursor toward a target area of a GUI. *Rosenberg* column 59 lines 49-61. Applicant respectfully traverses this rejection.

Rosenberg's teaching concerns forces applied to urge an input device to move such that an **on-screen cursor** moves toward a **target area of the GUI displayed**. Rosenberg teaches no relationship between the target area of the GUI and the range of motion of the input device. For example, if the input device is already near a limit of its range of motion, the motion urged by *Rosenberg's* teaching might not even be possible without repositioning of the input device. As another example, the forces can urge the input device such that the cursor hits a target area of the GUI but in a configuration that is near the device limits; motion starting from the target might then be prevented by the limits of the device. In contrast, Applicant's Claim 14 recites the limitation that the input device be urged to a **specific region of the device's range of motion**: a region from which uninterrupted motion along the device path is possible. Applicant's claim thus urges the input device to a particular starting position relative to the device's range of motion, **not** to a position that would match an on-screen cursor to an on-screen target. *Rosenberg* does not teach any such region, or forces urging motion to such a region. Accordingly, *Rosenberg* does not teach all the limitations of Claim 14, and there is no *prima facie* case of anticipation. Applicant submits that Claim 14, and Claim 25 depending therefrom, are in condition for allowance. *See* MPEP 2131; Verdergaal *Bros. v. Union Oil Company of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987); *Richardson v. Suzuki Motor Company*, 9 USPQ2D 1913, 1920 (Fed. Cir. 1989); MPEP 2143.03; In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

New Claims 35-37

Applicant has added new Claims 35-37, reciting explicitly characteristics of certain objects that are suitable for control with the present invention. Specifically, new Claims 35-37 are limited to control of objects corresponding to a simulation of physical objects. Rosenberg does not teach or suggest control of simulations of physical objects; rather, Rosenberg teaches only control of a cursor in a window GUI. The other art cited similarly does not teach or suggest control of objects corresponding to simulations of physical objects, in combination with the other limitations of Claims 35-37. Accordingly, Applicant submits that Claims 35-27 are in condition for allowance.